

Capsule dimorphism in *Justicia glauca* Rottler (Acanthaceae)

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Abstract

Heterocarpy in *Justicia glauca* Rottler is reported for the first time. The types of capsules, their position and regularity in the spike, and the types of seeds produced are detailed and compared with that of *J. heterocarpa*. Its taxonomic significance/insignificance, with a full description and illustration, is discussed.

INTRODUCTION

The genus *Justicia* L. is distributed in the warmer regions and is represented by about 420 species (Mabberley, 1987). Clarke (1872) listed about 50 species in the flora of British India. Heterocarpy, the production of two types of capsules, a rare occurrence in the Acanthaceae, was reported in *Justicia heterocarpa* T. Anderson, which is distributed in Tropical Africa and Pakistan, is restricted to the western parts in India, and a few close allies in the section *Harnieria*. Barring *J. heterocarpa* no such report has been made in any Indian species of *Justicia* nor in the family Acanthaceae. Apart from the presence of normal 4-seeded capsules, typical of the genus, *J. heterocarpa* bears indehiscent, 1-seeded and winged capsules, the wings extending into spiny flanges. *Justicia glauca* Rottler whose distribution is confined to the Deccan Peninsula in India is known to produce only one type of capsules. Specimens of this species collected in Andhra Pradesh and Tamil Nadu in the inflorescence, bracts and other floral characters but differed in the habit and presence of dimorphic capsules and seeds.

The description of *Justicia glauca* from normal populations as mentioned in various floras may be summarized thus: A branched undershrub, 75-10 cm high; branchlets terete. Leaves elliptic-ovate, rounded to acute at the base, entire along the margins, acute at the apex, 2.5-4.5 x 2-2.5 cm, pubescent; petioles to 1 cm long. Inflorescence a terminal spike, ca. 10 cm long; bracts opposite-decussate, broadly orbicular, ca. 8 x 5 mm, acute, puberulous, green, alternate ones sterile; bracteoles linear, minutely dentate, ca. 4 x 1 mm. Calyx 4-5 lobed; lobes lanceolate, acuminate, ca. 6 mm long, minutely ciliate. Corolla white with purple spots, narrowly infundibuliform, ca. 8 x 3 mm across, puberulous in the throat outside, 2-lipped; upper lip ca. 5 mm long; lower lip ca. 7 mm long; tube ca. 4 mm long. Stamens 2, to 4 mm long; lower anther lobe with a white basal appendage. Ovary ca. 1.5 mm long; style ca. 7 mm long,

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hairy. Capsules oblong, apically pointed, *ca.* 7.5 x 3 mm, swollen above the seeds, with a solid stalk, pubescent at tip, glabrous below, 2-loculed, 4-seeded; seeds dull cream-white, suborbicular, more or less compressed, *ca.* 2 mm; testa rugulose-tuberculate, spinulose when wet.

Position and Type of Capsules

The habit and the kinds of capsules seen in the present material are illustrated for a comparison (Fig. 1 A-I). These plants are much smaller in size (25-40 cm high; *cf.* 75-100 cm in normal populations), woody and with only one or two pairs of smaller leaves (0.5-1 x 0.2-0.4 cm; *cf.* 2.5-4.5 x 2-2.5 cm in normal populations). Inflorescence in a spike and fruiting spikes possess two types of capsules, the normal stalked-ones alternating with broader sessile ones. The normal ones (*ca.* 7.5 x 3 mm) are oblong, pointed, swollen above the seeds, glabrous except at the tip where it is faintly pubescent, loculicidal, 2-valved and 4-seeded. The lower portion of the capsule is sterile and solid usually for $\frac{1}{4}$ of the capsule's total length and gives the capsule a clavate appearance. In the sessile type (*ca.* 4 x 3.5 mm) the solid sterile base is absent and the capsular portion is broadly orbicular, pointed, finely pubescent althrough, 2-loculed and 1-seeded.

The seeds are discoid with an indentation at the base, the side of the hilum. The base of the seed is asymmetrical due to this indentation. The seeds (1.5-2.5 mm across) in normal capsules are cream-white and have a rugulose-tuberculate testa with the apices of the projections more or less conical and pointed. Cooke (1908) described the seeds as densely clothed with somewhat triangular acute tubercles. Such seeds are present in *J. glauca* only. However, the seeds (2.5-3 mm across) of the abnormal sessile capsules are dark brown, less compressed and larger with a rather smooth surface on either side except on the ridge where it is hispidulous.

Though *J. heterocarpa* and *J. glauca* (present material) produce dimorphic capsules, they differ in many respects. Both the types of capsules occur side by side in the axil of a bract in a sessile inflorescence in the former and in alternate axils one in each axil of the bract in a stalked inflorescence in the latter. Capsules in *J. heterocarpa*, both normal and abnormal, are sessile while in *J. glauca* only are the abnormal capsules sessile. Furthermore, the capsules in *J. heterocarpa*, as stated earlier, are winged with the angles produced into spiny flanges, 1-loculed, 1-seeded and indehiscent. On the contrary, in *J. glauca* the sessile capsules are not winged, 2-loculed, 1-seeded and dehiscent and one of the 2 locules invariably remains empty. However, seeds of the abnormal capsules in both the species are relatively larger compared to that of the normal capsules and seated nearly on a basal retinaculum. This heterocarpy is now known to occur in 15 taxa belonging to seven species in tropical Africa. True heterocarpic members of tropical Africa possess, in addition to normal four seeded capsules, one-seeded indehiscent fruits that are provided with entire or dissected wings (Hedren, 1989). However, a less well differentiated form of heterocarpy has been seen in *Justicia kirkiana* T. Anderson. Here the divergent fruits are one- or two-seeded and lack projections or wings. The present finding comes under this category. No taxonomic significance is attached to this observation

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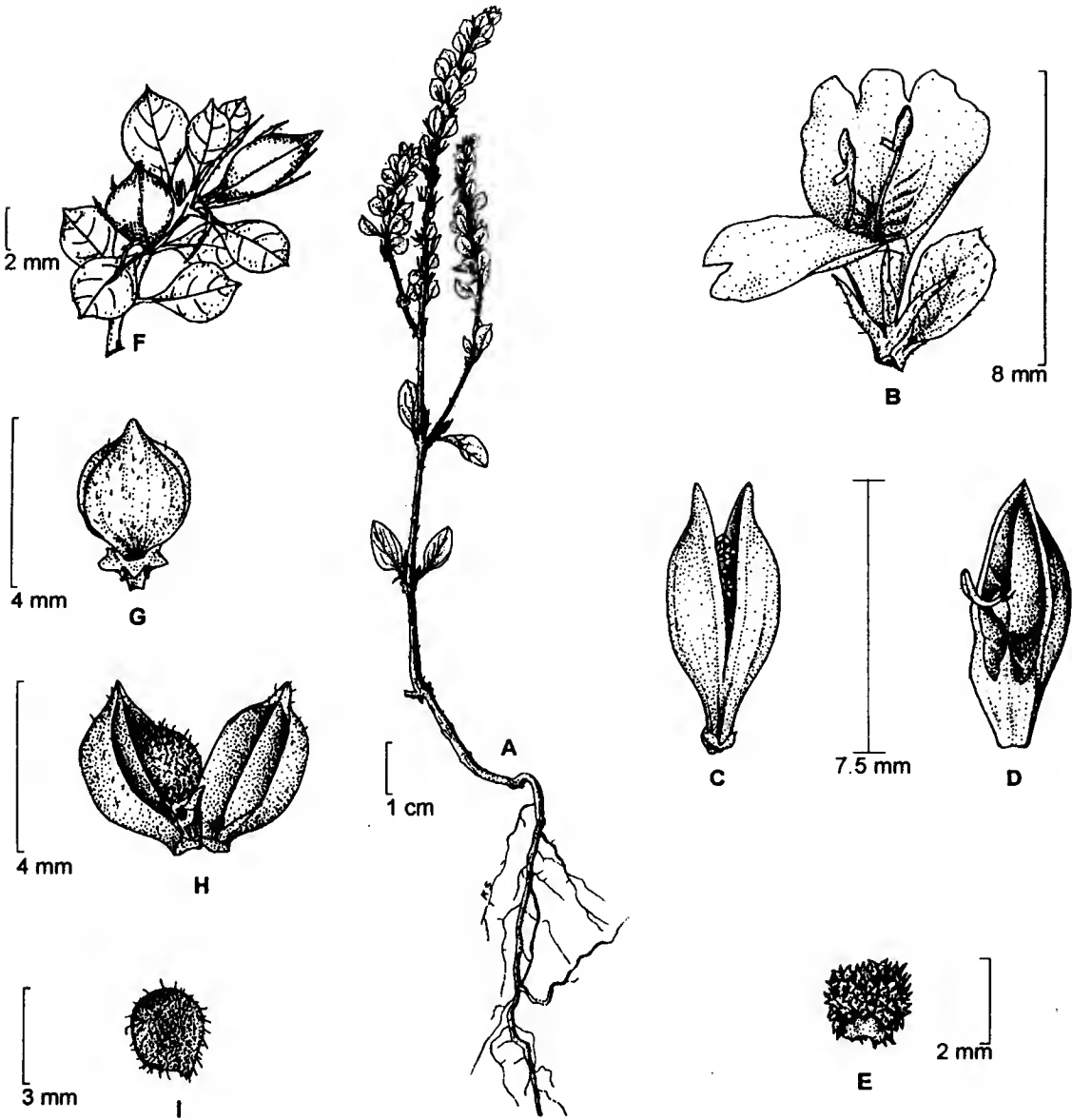


Fig. 1. *Justicia glauca* Rottler: A. Habit; B. Flower; C. Normal capsule – open; D. Section of capsule; E. Normal seed; F. Position of normal and abnormal capsules on spike; G. Abnormal capsule; H. Abnormal capsule - open; I. Abnormal seed.

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to recognize the present material as a distinct taxonomic entity for two reasons. Firstly, this may be xerophytic adaptation as the specimens collected were found to grow on desiccated sands, and may appear and disappear as a freak character. Secondly, there is some inconsistency in the regularity of occurrence of the sessile capsules in some of the spikes. About a dozen specimens in MH (*vide* Specimens examined) exhibited sessile capsules besides normal ones and with lesser incidence of the former. None of the earlier works (Gamble, 1936; Rani & Matthew, 1983) mentions the occurrence of dimorphism in the capsules of *J. glauca* and this is the first report. A new genus, *Harnieria*, was erected based on heterocarpy by Solms-Laubach (1864) separating it from *Justicia*. Bentham (1876) reduced it to a section under *Justicia* and placed all the species showing heterocarpy in this section. The present observation of heterocarpy in *Justicia glauca* is significant in two respects. It is the first report of heterocarpy in the Acanthaceae where the inflorescence is pedunculate. Secondly, it is inconsistent and less stabilized unlike the heterocarpy exhibited in species having sessile inflorescence.

Specimens examined: INDIA, **Andhra Pradesh:** Visakhapatnam Dist., Srungavarapukota, 4.9.1960, *Balakrishnan 11030* (2 sheets); Chintapalli, 30.8.1966, *Subbarao 28196* (2 sheets); Chintapalli, 12.11.1970, *Ellis 37100* (2 sheets); Nellore Dist., Naidupeta-Nellore highway, banks of a dried up stream, 5.12.2000, *Venu 112176* (3 sheets); Warangal Dist., Pakal lake, 8.8.1961, *Sebastine 1313* (2 sheets). **Tamil Nadu:** Ramnad Dist., Melakadu, 17.12.1964, *Ramamurthy 22748* (2 sheets); Thiruppathur, 29.11.1977, *Nair 52908* (2 sheets) (MH).

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